

sub-bifoveolata; pronoto dense punctato, 6-costulato, margine non-elevato; elytris costis 6 alternatim elevatis, intervallis bivenato-carinulatis, inderstitiis punctulatis; propygidio grosse punctato, in medio subelevato; prosterno lato, basi sinuato; mesosterno bisinuato, metasterno in medio subsulcato. L. $2\frac{1}{3}$ mill.

Hab. Amurland (*Christoph*).

This species has the thoracic margin and costæ as in *exaratus*, but the punctuation of the thorax is after the manner of *sulcatus*, but more dense. The elytra also are sculptured closely to the pattern of *exaratus*, but the punctures are not strigose. Between the second and third costæ at the base of each elytron there is a large and very deep sulcus, as is often the case in *sulcatus*.

Onthophilus hova, n. sp.

Ovalis, subconvexus, niger, nitidus; antennarum clava tarsisque flavis, fronte inæqualiter impressa; pronoto ocellato-punctato, margine magis dilatato, stria interna parallela fortiter elevata; elytris sutura et 4 costis elevatis, intervallis biseriatis punctatis, cum punctulorum linea intermedia; prosterno lateraliter marginato, basi sinuato; mesosterno bisinuato; metasterno profunde bifoveolato, in medio sulcato. L. $1\frac{3}{4}$ mill.

Hab. Madagascar (*Raffray*).

This species is very roughly sculptured and relatively longer than any other known species. It is allied to *costipennis* and *9-costatus*, from which the size, absence of thoracic carinæ, and the deep foveæ and sulcus in the metasternum, thus $\cdot \uparrow \cdot$, will distinguish it. It is slightly setose, and is probably a species which resides under bark like *hispidus* and *arboreus*.

XLIV.—Notes on some Fossil Plants collected by Mr. R. Dunlop, Airdrie, from the Lanarkshire Coal-field. By ROBERT KIDSTON, F.G.S.*

THROUGH the kindness of Mr. Dunlop I have had the opportunity of examining the fossil plants collected by him from several localities in the Lanarkshire Coal-field. The annexed list of species, compiled from this collection, though of considerable interest, must not be regarded as a complete representation of the Carboniferous fossil flora of this district; but it contains one or two species which have not been previously

* Read before the Geological Society of Glasgow, April 2, 1885.

recorded from Scotland. I have only to express my hope that Mr. Dunlop will continue his investigations in a field of natural history on which he has so successfully entered. Many of the specimens he has secured are exceedingly fine; of some of the species, they are finer than any I have yet seen from the British Coal-fields.

As it is my intention to work out the distribution of the Carboniferous flora, I am much indebted to Mr. Dunlop for the facilities he has given me in examining his specimens. I shall be very glad if others, who possess specimens of Carboniferous fossil plants, would kindly allow me to examine them, and so assist in working out their distribution; on my part I shall be most happy, as far as I can, to help any who may wish for assistance in the study of this most interesting class of fossils.

It is only possible by mutual cooperation to compile a complete list of the Carboniferous fossil plants from an area so large and rich as that of the British Coal-fields.

CALAMARIÆ.

CALAMITES, Suckow.

Weiss, in his two volumes on *Calamites**, has contributed so much to our knowledge of the stems and their ramification, the fructification, foliage, and roots of *Calamites*, that this group of fossil plants can no longer be looked upon as that about which we are most ignorant. His first volume deals chiefly with the fructification of *Calamites*, his second treats of the stems, as well as of the foliage and roots, with much additional information in regard to their fructification and systematic position.

The Calamariæ have usually been classed with the Equisetaceæ; but from the examination of their fructification it is seen that there are points in which they clearly differ from the recent *Equisetum*. On the other hand, there are some characters in which *Calamites* have a considerable similarity with the Equisetaceæ, and among recent plants it is certainly with this group they have the greatest affinity.

It would appear that *some* of the fossil cones which have been referred to the Calamariæ show that their upper part bore *microspores*, whilst their lower portion bore *macrospores*,

* "Steinkohlen-Calamarien.—Part I.," Abhandl. zur geologischen Specialkarte von Preussen und den Thüringischen Staaten, Band ii. Heft i. 1876; "Steinkohlen-Calamarien.—Part II.," Abhandl. &c. Band v. Heft ii. (1884).

nor are the spores provided with *elaters*, as in *Equisetum* *. But in the order Lycopodiaceæ some members are *heterosporous* and others *isosporous*. For example, *Lycopodium* has only one kind of spore (*isosporous*), while *Selaginella* has both *microspores* and *macrospores* (*heterosporous*). It may, perhaps, be found then that, although some of the cones which are supposed to belong to *Calamites* show a *heterosporous* condition, this may not be of sufficient importance to exclude them from the Equisetaceæ, where the spores are *isosporous*. It is also most probable that the genus *Calamites*, when its fructification is more fully examined, will require to be separated into many genera; and in this light the genus *Calamites*, as Weiss points out, can only be regarded as of a most provisional nature.

The roots of *Calamites* are those fossils to which Lindley and Hutton applied the name of *Pinnularia*.

From our present standpoint of knowledge Weiss proposes to divide the genus *Calamites* into the four following groups:—

CALAMITES, Suckow (provisional genus).

Division A. *Furrows on stems alternating at the nodes or joints.*

Group I. *CALAMITINA*, Weiss.

Branch-scars occurring periodically, the nodes bearing scars being separated from each other by a certain number of joints which do not bear branches. In most cases there is a distinct increase or decrease in the length of the joints which connect the branch-bearing nodes.

Group II. *EUCALAMITES*, Weiss.

Branch-scars occurring on every joint. The joints are of the same length or of irregularly different lengths.

Group III. *STYLOCALAMITES*, Weiss.

Branch-scars occurring without definite order, subordinate; often long stretches of the stem occur on which the branch-scars are entirely absent. The joints are of equal length or irregularly different.

* See also Dr. Williamson's papers on the structure of *Calamites* published at various dates in the 'Philosophical Transactions.'

Division B. *Furrows on the stem not alternating at the nodes or joints.*

Group IV. *ARCHÆOCALAMITES*, Stur (*Asterocalamites*, Schimper; *Calamites*, Brongniart).

Branch-scars irregularly distributed. Joints unequal in length.

For the purpose of classifying these fossils, the groups proposed by Weiss will be found most useful; but perhaps Nos. I., II., and III. had better be regarded at present as convenient *sections* rather than *genera*. Group IV., on the other hand, is so well defined, both as concerns its stems and fruit*, that it must be regarded as a true *genus* and quite distinct from *Calamites*.

In geological distribution groups I.—III. are characteristic of the Coal-measures; group IV. of the Lower Carboniferous (= Carboniferous Limestone series and Calciferous Sandstone series).

A good deal of discussion has taken place as to whether the exterior surface of the bark of *Calamites* was smooth or furrowed. It appears, as is often the case in such differences of opinion, that both views are correct in part. It now seems clearly proved that the species with thin bark show on their outer surface the characteristic furrows, but, on the other hand, the stems with thick bark show no trace of the furrows on their outer surface. The decorticated stems, however, are always distinctly furrowed, and it is in this condition that *Calamites* most frequently occur. This vexed question, from the careful investigations of Prof. Weiss, seems to be now satisfactorily settled.

Group I. *CALAMITINA*, Weiss.

Calamites (Calamitina) varians, Sternberg.

Calamites varians, Sternberg, Vers. ii. p. 50, pl. xii.

Remarks. This specimen belongs to one of the forms of this species, but is not in a good state of preservation.

Locality. Drumgray Coal, Airdrie.

Calamites (Calamitina), sp.

Remarks. Unfortunately only a small fragment of this

* The fruit of *Archæocalamites* is the *Pothocites Grantonii* of Paterson. See Ann. & Mag. Nat. Hist. May 1883, p. 297.

plant was collected. It belongs to the group of *Calamites* with a thick smooth bark. At the nodes the leaf-scars form a chain of transversely oval contiguous scars, similar to those occurring in *Calamites (Calamitina) varians*, var. *inconstans*, Weiss ('Steinkohlen-Calamarien,' vol. ii. p. 69, pl. xxv.). From the fragmentary nature of the specimen, however, I cannot with any certainty refer it to that species. We can only hope that more perfect examples will soon be found which will enable us satisfactorily to determine the species.

Locality. Blaes between Kiltongue and Drumgray Coals; Whiterigg Colliery, near Airdrie*.

Group II. *EUCALAMITES*, Weiss.

Calamites (Eucalamites) ramosus, Artis.

Calamites ramosus, Artis, Antedil. Phyt. pl. ii.

Calamites (Eucalamites) ramosus, Weiss, Steinkohlen-Calamarien, part ii. p. 98, pl. v. figs. 1, 2, pl. vi., pl. vii. figs. 1, 2, pl. viii. figs. 1, 2, and 4, pl. ix. figs. 1, 2, pl. x. fig. 1, pl. xx. figs. 1, 2.

Calamites nodosus, Lindley & Hutton, Foss. Flora, vol. i. pls. xv., xvi.

* As the plants from this bed occur in a state of great perfection, to show its exact position I append a section, which was procured for me by Mr. Dunlop from Mr. Prentice, manager of the colliery.

Section of Strata between the Kiltongue Coal and the Upper Drumgray Coal, showing the Fern-bed (Stanrigg Colliery, by Airdrie).

	ft.	in.
Coal (including 3 inches of gas-coal)	1	0
Dark fireclay	5	5
Coal	1	4
Fireclay	10	10
Argillaceous schist	5	6
Fireclay	1	1
Coal	6	6
Argillaceous schist	4	10
Sandstone	5	9
Argillaceous shale	1	1
Coal	8	8
Argillaceous shale	3	6
Sandstone	2	5
Argillaceous schist (<i>Fern-bed</i>)	2	6
Argillaceous shale	3	3
Sandstone	3	3
Argillaceous schist	1	8
Shale (dark), studded with <i>Anthracosia</i>	1	0
Argillaceous shale	8	8
Sandstone (hard)	5	6
Argillaceous shale	10	10
Coal (Upper Drumgray)	2	0

- Annularia radiata*, Zeiller, Végét. foss. du terr. houill. de la France, p. 24, pl. clx. fig. 1.
Asterophyllites radiatus, Brongniart, Class. d. végét. foss. p. 35, pl. ii. fig. 7.
Asterophyllites foliosus, Lindley & Hutton, Foss. Flora, vol. i. pl. xxv. fig. 1.
Annularia ramosa, Weiss, "Beobachtungen an Calamiten und Calamarien," Neues Jahrb. vol. ii. (1881).

Remarks. This species is very fully described by Weiss. The little branches, with verticillate leaves, each of which terminates in a sharp apex and is also tapered from its centre to its point of attachment with the stem, and which have been described as *Annularia radiata*, are now known to be the foliage of this plant. The fruit is also described by Weiss. This and the following species are the two most plentiful in the Scotch Coal-measures.

Localities. Blaes between Kiltongue and Drumgray Coals, Whiterigg, near Airdrie; Pits, Airdrie; Shettleston, near Glasgow; Bent Colliery, about 1½ mile E. of Bothwell.

Group III. *STYLOCALAMITES*, Weiss.

Calamites (Stylocalamites) Suckowii, Brongniart.

- Calamites Suckowii*, Brongniart, Hist. d. végét. foss. p. 124, pl. xiv. fig. 6, pl. xv. figs. 1-6, pl. xvi. figs. 2, 3 (2 fig. 1).
Calamites Suckowii, Zeiller, Végét. foss. du terr. houil. de la France, p. 12, pl. clx. fig. 1.
Calamites (Stylocalamites) Suckowii, Weiss, Steinkohlen-Calamarien, part ii. p. 129, pl. ii. fig. 1, pl. iii. figs. 2, 3, pl. iv. fig. 1, pl. xxvii. fig. 3.

Localities. Pits near Airdrie; Bent Colliery, about 1½ mile E. of Bothwell.

CALAMOCLADUS, Schimper.

Calamocladus equisetiformis, Schlotheim, sp.

- Calamocladus equisetiformis*, Schimper, Traité d. paléont. végét. vol. i. p. 324, pl. xxii. figs. 1-3.
Asterophyllites equisetiformis, Brongniart, Prodrome, p. 159; Germar, Vers. v. Wettin u. Löbejun, p. 21, pl. viii.
Hippurites longifolia, Lindley & Hutton, Fossil Flora, vol. iii. pls. exc., xci.
Casuarinites equisetiformis, Schlotheim, Flora d. Vorwelt, p. 30, pl. i. figs. 1, 2, pl. ii. fig. 3.

Remarks. A very fine specimen of this species has been collected. It shows the remains of four branches, the longest of which, however, is incomplete, but measures 8 inches and bears seventeen whorls of leaves. From the position in which the branches lie to each other they have evidently been

attached to a common stem. Each whorl contains about thirty leaves.

Localities. Bent Colliery, about $1\frac{1}{2}$ mile E. of Bothwell; Blaes between Kiltongue and Drumgray Coals, Whiterigg, near Airdrie.

Calamocladus grandis, Sternberg, sp.

Calamocladus grandis, Schimper, Traité d. paléont. végét. vol. i. p. 325.

Bechera grandis, Sternberg, Vers. i. fasc. iv. p. xxx, pl. xlix. fig. 1.

Remarks. Most probably this species is not distinct from *Calamocladus equisetiformis*, Schl. sp.

Locality. Bent Colliery, about $1\frac{1}{2}$ mile E. of Bothwell.

ANNULARIA, Sternberg.

Annularia patens, Sauveur, sp.

Asterophyllites patens, Sauveur, Végét. foss. du terr. houil. de la Belgique, pl. lxxix. fig. 4.

Description. Stem faintly striated longitudinally; internodes varying in length (according to the age of the specimen). Leaves whorled, numerous (8-16 in a whorl), long, linear, narrow, single-nerved, and terminating in a sharp point; basal portion of leaf not contracted. The leaves vary in length from $\frac{3}{10}$ of an inch on the smaller branches to nearly an inch on the larger, and in width from $\frac{1}{20}$ to $\frac{1}{25}$ of an inch. From the leaf-whorls are given off lateral branchlets.

Remarks. Of this species the only figure with which I am acquainted is that given by Sauveur, which only shows a portion of a whorl of leaves. Unfortunately no description accompanies his sketch.

The leaves are long in proportion to their breadth and of equal width throughout, and this, in connexion with their not being contracted at their base, easily distinguishes *Annularia patens* from *Annularia radiata*. The leaves are generally rather longer than one and a half times the length of the internodes. On the smaller branches of course the leaves and internodes are smaller than on the larger branches, but they usually hold the same proportional relationship to each other in size. One small example shows a lateral branch springing from the axil of one of the leaves; but none of the other nodes of this example gives rise to branches. From this its mode of ramification appears to be irregular.

Although this species has not been previously recorded from Britain, I have seen it, in addition to the Airdrie locality, from the Coal-measures, Furnace Bank Pit, Old

Sauchie, near Alloa, and Devonside, Tillicoultry, Clackmannanshire; and Blairpoint, Dysart, Fife.

Locality. Pit, near Airdrie.

(?) RHIZOCARPEÆ.

SPHENOPHYLLUM, Brongniart.

Sphenophyllum cuneifolium, Sternberg, sp.

Sphenophyllum cuneifolium, Zeiller, Végét. foss. du terr. houil. de la France, p. 30, pl. clxi. figs. 1, 2.

Sphenophyllum erosum, Lindley & Hutton, Fossil Flora, vol. i. pl. xiii.

Rotularia cuneifolia, Sternberg, Vers. i. fasc. ii. p. 33, pl. xxvi. fig. 4.

Rotularia pusilla, Sternberg, Vers. i. fasc. iv. p. xxxii.

Localities. Pit, Airdrie; Bent Colliery, about 1½ mile E. of Bothwell.

FILICACEÆ.

Sphenopteridæ.

RENAULTIA, Zeiller.

Renaultia microcarpa, Lesquereux, sp.

Sphenopteris microcarpa, Lesquereux, Coal Flora of Pennsylv. p. 280, pl. xlvii. fig. 2.

Sphenopteris microcarpa, Kidston, Ann. & Mag. Nat. Hist. ser. 5, vol. x. p. 9, pl. i. figs. 7-14.

Renaultia (Sphen.) microcarpa, Zeiller, Ann. d. Sciences Nat. 6^e sér. Bot. vol. xvi. p. 185.

Remarks. The fruit of this species was first described by Lesquereux, but later and more fully by myself. It consists of small oval exannulate sporangia which are situated at the extremities of the veins.

Localities. Roof of Kiltongue Coal, Mount Vernon; Pit, near Airdrie.

SPHENOPTERIS, Brongniart.

(?) *Sphenopteris trifoliolata*, Artis (not Brongn.).

Sphenopteris trifoliolata, Brongn. Prodrôme, p. 50.

Filicites trifoliolatus, Artis, Antedil. Phyt. pl. xi.

Remarks. The specimen I refer to this species is small and not in a good state of preservation for a satisfactory determination; hence this record of the occurrence of this species requires corroboration.

I have, however, previously seen this species from Wishaw.

Locality. Bent Colliery, about 1½ mile E. of Bothwell.

Sphenopteris obtusiloba, Brongniart.

Sphenopteris obtusiloba, Brongniart, Hist. d. végét. foss. p. 204, pl. liii. fig. 2*.

Sphenopteris irregularis, Andræ, Vorwelt Pflanzen, p. 24, pl. viii. pl. ix. fig. 1.

Sphenopteris irregularis, Sternberg, Vers. ii. p. 63, pl. xvii. fig. 4, p. 152, pl. ix. fig. 7.

Sphenopteris latifolia, Lindley & Hutton, Fossil Flora, vol. ii. pl. clvi., vol. iii. pl. clxxviii.

Sphenopteris trifoliolata, Brongniart (not Artis), Hist. d. végét. foss. p. 202, pl. liii. fig. 3 (excl. refer.).

Remarks. Exceedingly fine specimens of this were collected.

Locality. Blaes between Kiltongue and Drumgray Coals, Whiterigg, near Airdrie.

Sphenopteris furcata, Brongniart.

Sphenopteris furcata, Brongniart, Hist. d. végét. foss. p. 179, pl. xlix. figs. 4, 5.

Diplothemema furcatum, Zeiller, Végét. foss. du terr. houil. de la France, p. 45, pl. clxii. fig. 3.

Locality. Cutting, new Caledonian Railway, Airdrie.

Sphenopteris, sp.

Remarks. The specimens I place here have a great resemblance to *Sphenopteris rotundifolia*, Andræ ('Vorweltliche Pflanzen,' p. 37, pl. xii.), but, as it is necessary to use great care in recording the occurrence of a species, I will refrain at present from applying the specific name of "*rotundifolia*, Andræ," to them, and await further evidence before definitely determining this fern. But to whichever species this plant belongs, these examples are the first I have seen.

Locality. Blaes between Kiltongue and Drumgray Coals, Whiterigg, near Airdrie.

MARIOPTERIS, Zeiller.

Mariopteris, Zeiller, Bull. Soc. Géol. de France, 3^e sér. vol. vii. p. 92; Végét. foss. du terr. houil. de la France, p. 68 (from vol. iv. de l'explication de la carte géologique de la France, 1880).

This genus was founded by Zeiller to include certain ferns which, among other characters, are distinguished by a peculiar dichotomizing of their pinnæ. The primary pinnæ are attached to the rachis by a naked stalk, which bifurcates at a very obtuse angle; each of the forks of this first dichotomy again bifurcates, forming the secondary pinnæ, on which are borne the tertiary pinnæ, which in turn support the pinnules.

Mariopteris latifolia, Brongniart, sp.

Mariopteris latifolia, Zeiller, Bull. de la Soc. Géol. de France, 3^e sér. vol. vii. p. 92, pl. vi.

Sphenopteris latifolia, Brongniart, Hist. d. végét. foss. p. 205, pl. lvii. figs. 1-4.

Locality. Roof of the Kiltongue Coal, Mount Vernon.

Mariopteris muricata, Schlotheim, sp.

Mariopteris muricata, Zeiller, Bull. Soc. Géol. de France, 3^e sér. vol. vii. p. 92.

Pecopteris muricata, Brongniart, Hist. d. végét. foss. p. 352, pl. xc. figs. 3, 4, and pl. xcvi.

Filicites muricatus, Schlotheim, Flora d. Vorwelt, p. 54, pl. xii. figs. 21 and 23.

Locality. Bent Colliery, about 1½ mile E. of Bothwell.

Mariopteris nervosa, Brongniart, sp.

Mariopteris nervosa, Zeiller, Végét. foss. du terr. houil. de la France, p. 69, pl. clxvii. figs. 1-4.

Pecopteris nervosa, Brongniart, Hist. d. végét. foss. p. 297, pl. xciv. and pl. xc. figs. 1, 2.

Pecopteris nervosa, Lindley & Hutton, Fossil Flora, vol. ii. pl. xciv.

Remarks. Some of the specimens are very fine.

Locality. Bent Colliery, about 1½ mile E. of Bothwell.

NEUROPTERIS, Brongniart.

Neuropteris heterophylla, Brongniart.

Neuropteris heterophylla, Brongniart, Hist. d. végét. foss. p. 243, pl. lxxi., and pl. lxxii. fig. 2.

Neuropteris heterophylla, Zeiller, végét. foss. du terr. houil. de la France, p. 49, pl. clxiv. figs. 1, 2.

Neuropteris Loshii, Brongniart, Hist. d. végét. foss. p. 242, pl. lxxii. fig. 1, and pl. lxxiii.

Cyclopteris trichomanoides, Brongniart, Hist. d. végét. foss. p. 49, pl. lxi. bis, fig. 4.

Remarks. Some exceedingly fine specimens of this fern, from blaes lying between the Kiltongue and Drumgray Coals, which were brought up while driving a road, were collected by Mr. Dunlop at Whiterigg Pit, near Airdrie. These examples are the finest British specimens I have seen.

Several specimens of *Cyclopteris trichomanoides*, Brongn., which at one time was supposed to form a distinct species of a different genus, have also been collected. These peculiar cyclopteroid pinnules were attached to the main rachis of the fern, and a figure showing their relation to the other parts of the frond has been given by Röhl (Vers. d. Steink.-Form.

Westphalens, pl. xvii.). *Neuropteris heterophylla* and *Neuropteris Loshii* are now known to represent only different portions of the same species.

Localities. Blaes between Kiltongue and Drumgray Coals, Whiterigg, near Airdrie; cutting, new Caledonian Railway, Airdrie; roof of Kiltongue Coal, Mount Vernon (at the two last-mentioned localities pinnules of the so-called *Cyclopteris trichomanoides* also occurred); Bent Colliery, about 1½ mile E. of Bothwell.

Neuropteris gigantea, Sternberg.

Neuropteris gigantea, Sternberg, Vers. i. fasc. iv. p. xvi; Brongniart, Hist. d. végét. foss. p. 240, pl. lxix.
Osmunda gigantea, Sternberg, Vers. i. fasc. ii. pp. 33, 36, pl. xxii.

Remarks. The specimen from Coatbridge shows the fern in circinate vernation.

Localities. Bent Colliery, about 1½ mile E. of Bothwell; Coatbridge.

Neuropteris Scheuchzeri, Hoffmann.

Neuropteris Scheuchzeri, Hoffman, in Keferstein, Teutschland geogn.-geolog. dargestellt, vol. iv. p. 157 (excl. figs.).
Osmunda, Scheuchzer, Herbarium diluvianum, p. 37, pl. x. fig. 3 (ed. 1709).

Remarks. The synonymy of this species is in a very unsatisfactory state; I therefore refrain from giving any further references.

Neuropteris Scheuchzeri, which is one of the earliest figured ferns, occurs plentifully in some of the English Coal-fields; but the examples from Whiterigg are the first I have seen from a Scotch locality. Some of the specimens are very good, and showed attached to the main axis large cyclopteroid pinnules analogous to those to which reference has already been made in regard to *Neuropteris heterophylla*, Brongn.

Locality. Whiterigg Pit, near Airdrie.

ALETHOPTERIS, Sternberg.

Alethopteris lonchitica, Schlotheim, sp.

Alethopteris lonchitidis, Sternberg, Vers. i. fasc. iv. p. xxi.
Pecopteris lonchitica, Brongniart, Hist. d. végét. foss. p. 275, pl. lxxxiv.;
Lindley & Hutton, Fossil Flora, vol. ii. pl. cliii.
Pecopteris heterophylla, Lindley & Hutton, Fossil Flora, vol. i. pl. xxxviii.

Remarks. This is one of the commonest ferns of the Scotch

Coal-measures and is subject to great variation. To many of these varieties specific names have been given.

Localities. Roof of Kiltongue Coal, Mount Vernon. Bent Colliery, about $1\frac{1}{2}$ mile E. of Bothwell.

RHACOPHYLLUM, Schimper.

(?) *Rhacophyllum filiforme*, Gutbier, sp.

Fucoides fliformis, Gutbier, Vers. d. Zwickauer Schwarzkohlengebirges, p. 12, pl. i. fig. 9.

Remarks. Among the fossils is a small specimen of *Rhacophyllum* with filiform segments, which, though not very well preserved, is, I believe, referable to this species.

Locality. Cutting, new Caledonian Railway, Airdrie.

LYCOPODIACEÆ.

LEPIDODENDRON, Sternberg.

Lepidodendron Sternbergii, Brongniart.

Lepidodendron Sternbergii, Brongniart, Prodrôme, p. 85; Lindley & Hutton, Fossil Flora, vol. i. pl. iv., vol. ii. pl. cxii., vol. iii. pl. cciii.

Lepidodendron dichotomum, Sternberg (in part), Vers. i. fasc. i. pp. 19, 23, pls. i., ii. (excl. pl. iii.); and Vers. ii. p. 177, pl. lxxviii. fig. I.

Lepidodendron elegans, Hist. d. végét. foss. vol. ii. pl. xiv.; Lindley & Hutton, Fossil Flora, vol. ii. pl. cxviii., vol. iii. pl. cxcix.

Lepidodendron gracile, Lindley & Hutton, Fossil Flora, vol. i. pl. ix.; Brongniart, Hist. d. végét. foss. vol. ii. pl. xv.

Lepidodendron lycopodioides, Sternberg, Vers. i. fasc. 2, p. 31, pl. xvi. figs. 1, 2, and 4.

Remarks. One or two very fine specimens of that form of *Lepidodendron Sternbergii* which has been named *L. lycopodioides* by Sternberg and *L. elegans* by Brongniart were collected from a cutting on the new Caledonian Railway, near Airdrie.

Lepidodendron elegans and *L. gracile* appear to be only the younger and smaller branches of *Lepidodendron Sternbergii*, and not specifically distinct from that plant.

Localities. Cutting on new Caledonian Railway, Airdrie (*L. elegans*). Pit, Airdrie (*L. Sternbergii*). Bent Colliery, about $1\frac{1}{2}$ mile E. of Bothwell (*L. gracile*).

Lepidodendroid Branches.

Under this head I include two fine slabs from Whiterigg, which show on their surface a number of delicate twigs, measuring in some cases 10 or 11 inches in length, and about $\frac{1}{4}$ inch wide at their broadest part, including the leaves. The

stems alone which bear the leaves are a little more than one tenth of an inch thick. The branches diminish gradually in width towards their apex. The leaves are very narrow, and about one fifth of an inch long. These two fossils are similar to those figured by Röhl as *Lycopodites selaginoides* ('Fossile Flora der Steinkohlen-Formation Westphalens,' pl. vii. fig. 3).

I prefer, however, to record these specimens merely as *Lepidodendroid* twigs, rather than to place them under *Lycopodites*, for this genus, as founded by Brongniart, contained a number of Coniferous branches and small twigs of *Lepidodendron*, and was subsequently given up by that author; but *Lycopodites*, as resuscitated by Goldenberg*, contains certain plants very closely related to the recent genus *Lycopodium*, and quite distinct from *Lepidodendron*, and as the specimens from Whiterigg appear to be only young twigs of *Lepidodendron* (though of which species of *Lepidodendron* I am unable to say), they cannot be referred to *Lycopodites*, as restricted by Goldenberg.

Locality. Blaes between Kiltongue and Drumgray Coals, Whiterigg, near Airdrie.

LEPIDOPHLOIOS, Sternberg.

Lepidophloios, sp.

Remarks. This genus is only represented by a fragment of a compressed stem, showing the Halonian condition of *Lepidophloios*, it now being known that *Halonia*, Lindley and Hutton, and *Cyclocadia ornata*, Goldenberg †, are the fruiting branches of *Lepidophloios*.

The example from Airdrie agrees in all respects with Goldenberg's figure. As the leaf-scars are not preserved on the fossil it is impossible to distinguish the species of *Lepidophloios* to which this fragment belongs.

Locality. Pit, Airdrie.

LEPIDOPHYLLUM, Brongniart.

Lepidophyllum lanceolatum, Lindley & Hutton.

Lepidophyllum lanceolatum, Lindley & Hutton, Fossil Flora, vol. i. pl. vii. figs. 3, 4.

Remarks. In *Lepidophyllum* are placed isolated bracts

* Goldenberg, 'Flora Saræpontana fossilis,' Heft i. pp. 9, 10 (1855). See also Kidston, Ann. & Mag. Nat. Hist. Aug. 1884, p. 111.

† Goldenberg, 'Flora Saræpontana fossilis,' Heft i. p. 20, pl. iii. fig. 11.

and leaves, which apparently belong in part to *Lepidodendron*, *Lepidophloios*, and *Sigillaria*.

Localities. Pit, Airdrie. Bent Colliery, about 1½ mile E. of Bothwell.

LEPIDOSTROBUS, Brongniart.

Lepidostrobus variabilis, Lindley & Hutton.

Lepidostrobus variabilis, Lindley and Hutton, Fossil Flora, vol. i. pls. x., xi.

Remarks. Under this name are most probably included the cones of different species of Lycopods.

Locality. Blackband, Airdrie; Bent Colliery, about 1½ mile E. of Bothwell.

SIGILLARIA, Brongniart.

Sigillaria discophora, König, sp.

Lepidodendron discophorum, König, Icones fossilium sectiles, pl. xvi. fig. 194 (1825).

Ulodendron majus, Lindley & Hutton, Fossil Flora, vol. i. pl. v. (excl. ref.).

Ulodendron minus, Lindley & Hutton, Fossil Flora, vol. i. pl. vi. (excl. ref.).

Remarks. *Ulodendron minus*, L. & H., is only a smaller specimen of their *Ulodendron majus*, and both are similar to the plant described by König as *Lepidodendron discophorum*.

It is now known that certain *Ulodendra*, such as *U. parmatum*, Carruthers (= *U. commutatum*, Schimper), belong to *Lepidodendron Veltheimianum*, Sternberg, and there are other *Lepidodendra* which also bear Ulodendroid scars. But in addition to *Lepidodendra*, some Clathrarian *Sigillarie* were likewise provided with Ulodendroid scars, of which *Sigillaria discophora* is an example. Ulodendroid scars also occur in the genus *Rhytidodendron*, Boulay. The presence of these large scars cannot then be regarded as a generic character. The leaf-scars only afford the necessary comparative points for the classification of these so-called Ulodendroid Lycopods, and the leaf-scars of *Sigillaria discophora* are essentially those of a Clathrarian *Sigillaria*.

Locality. Pit, near Airdrie.

Sigillaria notata, Steinhauer, sp.

Sigillaria notata, Brongniart, Hist. d. végét. foss. p. 449, pl. cliii. fig. 1.

Phytolithus notatus, Steinhauer, Amer. Phil. Trans. vol. i. pl. vii. fig. 3.

Remarks. This collection contains only one small speci-

men of this species, with narrow ribs and proportionately small leaf-scars. The leaf-scars are more distant than figured by Brongniart; but in this character the plant varies much.

Locality. Bent Colliery, about $1\frac{1}{2}$ mile E. of Bothwell.

Sigillaria, sp.

Remarks. I place here a small decorticated example of a *Sigillaria*, which, in the absence of the outer surface of the stem, does not afford sufficient characters for a specific identification. It is the *Sigillaria* (*Syringodendron*) *cyclostigma*, Brongn. (Hist. d. végét. foss. pl. clxvi. fig. 3), of which, however, nothing more can be said than that it is a decorticated condition of a *Sigillaria*.

Locality. Baillieston.

Lycopod Spores.

Remarks. These are probably the spores of *Lepidodendron* or *Sigillaria*. They are about $\frac{1}{25}$ inch in diameter, and apparently belong to Reinsch's group *Triletes**. These little spores almost entirely cover the surface of some small slabs, and are restricted to the "parting" of the stone.

Locality. Blaes at old pit, near Airdrie.

STIGMARIA, Brongniart.

Stigmaria ficoïdes, Brongniart.

Stigmaria ficoïdes, Brongniart, Class. d. végét. foss. p. 9, pl. i. fig. 7;

Lindley & Hutton, Fossil Flora, vol. i. pls. xxxi.-vi.

Stigmaria ficoïdes (and vars.), Göppert, Gatt. d. foss. Pflanzen, Lief. 1, 2, p. 13, pls. viii.-xvi.

Remarks. *Stigmarie*, the roots of *Lepidodendron* and *Sigillaria*, are common throughout the whole of the Coal-measures. The specimen from Airdrie shows a transition from the *Lepidodendroid* leaf-scar to the *Stigmarian* root-scar. The *Stigmarian* vascular scar is here surrounded by a "field," similar to that which surrounds the vascular impression of the *Lepidodendroid* leaf-scar.

Stigmaria ficoïdes, var. *reticulata* (Göppert), has also been met with.

Localities. Common throughout the whole district. *Stigm. ficoïdes*, var. *reticulata*: above oil-shales, Airdrie.

* 'Micro-Palæo-Phytologia Formationis Carboniferæ,' vol. i. p. 1, 1884. (Vols. i. and ii. Erlangen, Bavaria, 1884. Many hundreds of these organisms are figured in this work.)

CYCADACEÆ.

CORDAITES, Unger.

The internal organization of the leaves, flowers, and stems of *Cordaites* have been fully described by Grand'Eury and Renault*. According to Grand'Eury, the stems of *Cordaites* attained a height of from 20 to over 30 feet, and were irregularly ramified. At the upper extremities of the branches and stems were borne the long narrow leaves. In *Cordaites* the pith was chambered and the curious fossils, variously called *Sternbergia* or *Artisia*, are casts of its pith-cavity.

The wood in structure approaches closely to that of the Coniferae, and was previously described as *Pinites Brandlingii* by Witham. It is also most probable that many of the fossil woods referred to *Pinites*, Witham (*Araucarioxylon*, Kraus; *Araucarites*, Göppert), are portions of the stems of *Cordaites*. The wood-fibres bear one or many vertical rows of bordered pits. The leaves are more or less long in proportion to their width; and from characters derived from these organs, Grand'Eury proposes for *Cordaites* the three following divisions:—

I. *Eucordaites*.—Leaves spathulate, obovate, elliptical, or lanceolate, sessile, entire, with rounded apices and of leathery consistency. The leaves are from 20–90 centim. in length. The nerves are either equally or unequally strong.

II. *Dorycordaites*.—Leaves lanceolate with sharp points; nerves numerous, fine, and equal in strength. The leaves attain a length of from 40–50 centim.

III. *Poacordaites*.—Leaves narrow, linear, entire, blunt at the point, with nerves nearly equally strong. The leaves are as much as 40 centim. in length†.

The flowers of *Cordaites* are monoecious. The male flowers consist of a number of imbricated bracts, in the axils of which are situated the stamens, or they are placed around the depressed apex of the axis of inflorescence. The female flower contains several naked ovules, which are each short-stalked and set in the axils of the bracts. Their fertilization takes place in a somewhat similar manner to that of the Cycads

* For a full description of the structure of *Cordaites*, see Renault, 'Cours de botanique fossile,' première année (Paris, 1881); Grand'Eury, "Flore carbonifère du Département de la Loire et du centre de la France" (1877); Zittel-Schenk, 'Handbuch der Paläontologie,' ii. Band, Lief. iii. p. 241 (1884).

† Since writing the above a new type of *Cordaites* has been described by Renault and Zeiller, which they have named *Scutocordaites* ('Comptes Rendus,' March 23, 1885).

and Conifers. During the maturation of the fruit the short stalk, to which the seed is attached, in some cases becomes much elongated, as in *Cardiocarpus* (*Cordaianthus*) *Lindleyi*, Carruthers, and *Cardiocarpus anomalus*, Morris, sp. In very few cases have the flowers been found in union with their parent stems, so till we know to which species of *Cordaites* the isolated inflorescences and fruits belong, it is necessary to apply to them specific names in order that their occurrence may be recorded. The structure of the seeds has been investigated by Brongniart*.

From the results of the observations of these botanists, who have been successful in securing specimens preserved in silica, in which the most minute details of structure are exhibited, even to the pollen-grains, it appears that *Cordaites* must be looked upon rather as a *group* of plants than a *genus*. In certain structural points *Cordaites* approaches closely to the Coniferæ, in other respects to the Cycads; but taking into account all the structural peculiarities of the plants, their affinities appear to be more Cycadaceous than Coniferous.

I have given but a meagre outline of the organization of these plants, and must refer those who are interested in the subject to the original works of the authors quoted.

From the fragmentary manner in which *Cordaites* usually occur, the chief specific characters are derived from the neuration of the leaves.

Cordaites (*Eucordaites*) *principalis*, Germar, sp.

Cordaites principalis, Geinitz, Vers. d. Steinkf. in Sachsen, p. 41, pl. xxi. figs. 1-6 (excl. fig. 22).

Cordaites principalis, Weiss, Foss. Flora d. jüing. Stk. u. d. Rothl. p. 200.

Flabellaria principalis, Germar, Vers. v. Wettin. u. Löbejun, p. 55, pl. xxiii.

Pycnophyllum principale, Schimper, Traité de paléont. végét. vol. ii. p. 191.

Description. Leaves long, attaining a length of from 12 to 18 inches, and sometimes rather over 2 inches wide, narrowed towards the base and again narrowing towards the apex, the extreme point of which is rounded or obtuse; seven or eight of the stronger nerves in one tenth of an inch, between which are from three to five finer (?) nerves.

Remarks. In well-preserved specimens there are seen running parallel with and between the strong nerves from three to five fine lines. These are described by Geinitz as vertical

* Brongniart, 'Recherches sur les graines fossiles silicifiées' (Paris, 1881). Also, "Etudes sur les graines fossiles trouvées à l'état silicifié dans le terrain houiller de Saint Etienne," Annales des Sciences Nat. botan. 5^e sér. vol. xx. pls. xxi.-xxiii.

rows of cells, and his fig. 2, pl. xxi., shows these finer lines strongly magnified, and certainly they here appear more like rows of tabular cells than veins; but Weiss, in his description of the species, calls them nerves. Only very perfectly preserved specimens can decide whether the finer lines placed between the strong nerves are rows of cells or finer nerves.

The plant included here I have little doubt is Gernar's species. It is very frequent in the Scotch Coal-fields.

Locality. Bent Colliery, about $1\frac{1}{2}$ mile E. of Bellshill.

CARDIOCARPUS, Brongniart.

Cardiocarpus (Cordaianthus) Lindleyi, Carruthers.

Cardiocarpon Lindleyi, Carruthers, Notes on some Fossil Plants, figs. 1 & 2, Geol. Mag. vol. ix. 1872.

Cardiocarpon acutum, Lindley & Hutton, Fossil Flora, vol. i. pl. lxxvi.

Cardiocarpon apiculatum, Berger & Göppert, Fruct. et semin. p. 23, pl. ii. fig. 32.

Antholites Pitcairnie, Lindley & Hutton, Fossil Flora, vol. ii. pl. lxxxii.

Remarks. These little seeds have been found attached to stems, which were previously called *Antholites Pitcairnie*, Lindley & Hutton, by Mr. C. W. Peach, at the Cleuch, Falkirk, and have been described and figured by Mr. Carruthers in the Geol. Mag. vol. ix. 1872.

As *Cardiocarpon Lindleyi* is almost invariably found associated with *Cordaites principalis*, it is perhaps the fruit of that species.

Locality. Bent Colliery, Bellshill.

CORDAIANTHUS, Grand'Eury.

Cordaianthus, sp.

Remarks. This specimen is probably a young condition of *Antholites Pitcairnie*, L. & H., and is the female inflorescence of a *Cordaites*. The fossil shows an axis $3\frac{1}{4}$ inches long, and at its basal extremity it is fully $\frac{1}{10}$ inch wide. On each side of the stem is a vertical row of alternate bracts, from the axils of some of which traces of fruit-pedicels can be seen. Each row contains about twenty groups of bracts; those at the base of the inflorescence are about $\frac{1}{5}$ inch long and rather less than $\frac{1}{10}$ inch wide; but they become slightly smaller and more distant towards the upper part of the specimen, of which, however, the extreme apex is wanting. The structure and number of bracts in each group is not shown. On the same slab is a specimen of *Cardiocarpus Lindleyi*. This example of *Cordaianthus* was found associated with *Cordaites principalis*, Gernar, sp.

Locality. Bent Colliery, about $1\frac{1}{2}$ mile E. of Bothwell.

Of uncertain Affinity.

TRIGONOCARPUS, Brongniart.

Trigonocarpus Parkinsoni, Brongniart.*Trigonocarpum Parkinsonis*, Brongniart, Prodrôme, p. 137.*Trigonocarpum Noeggerathii*, Lindley & Hutton (not Sternberg), Fossil Flora, vol. ii. pl. cxlii. c; vol. iii. pl. exciii. figs. 1-4 B, pl. cccxii. figs. 2 and 4.

Remarks. *Carpolithes alatus*, Lindley and Hutton ('Fossil Flora,' vol. ii. pl. lxxxvii., vol. iii. pl. ccx. B), appears to be only *Trigonocarpus Parkinsoni* enclosed in its pericarp. It is not yet discovered to which plant these seeds belong.

Specimens of a *Trigonocarpus* have been found in which the internal structure was preserved, and these show that it is Gymnospermous.

Locality. Roof of Kiltongue Coal, Mount Vernon.

XLV.—*Description of a Species of Wild-Mulberry Silkworm, allied to Bombyx, from Chehkiang, N. China.* By F. MOORE, F.Z.S., A.L.S., &c.

THE wild species of silkworm, of which the following is a description, was recently procured by Mr. F. Kleinwächter, Commissioner of the Imperial Maritime Customs, Peking, who obtained it from Wu-lou, on the borders of the Tai-hu, province of Chehkiang, where it is found feeding on the wild mulberry. During the present month (May) specimens have also been brought home by Mons. Fauvel, one of the Commissioners of the Imperial Maritime Customs, who found them at Hankeou on the wild mulberry.

For the specimens and the opportunity of describing this new insect I have to thank Mons. Natalis Rondot of Paris, and the Chamber of Commerce of Lyons, to whose energy and special labours in sericulture we are indebted for the knowledge of this species, as well as for several other interesting and valuable silk-producers.

RONDOTIA, nov. gen.

Fore wing shorter and more triangular in form than in typical *Bombyx* (*B. mori*); apex shorter, not subfalcate, exterior margin acutely angular at end of upper median vein: hind wing with the apex regularly convex; exterior margin oblique hindward, slightly sinuous and distinctly angular at end of lower median vein. Cells comparatively broader and shorter. Venation similar, except that in the fore wing the fourth subcostal branch is emitted nearer the apex, and in the hind wing the two subcostals are emitted at fully half beyond the cell, instead of close to the end, and the middle median